Asphalt Block Pavement

BY

CHAS. BAILLAIRGE, C.E.

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C. BAILLAIRGE, C.E.

The new asphalt block pavement, so-called, is new to Canada, though known and used in a few places in the United States for some time. It is now being laid along the Grande Allee, or St. Louis road, Quebec, extending from the Gate to De Salaberry street, a run of 3,700 feet; and the width being 47 feet from curb to curb; the area, including crossings, will be some 20,000 yards, which at 25 bricks to the yard (the blocks being 12 x 4 x 4 inches), will require half a million blocks. The writer was not slow to recommend their use; as, before he ever heard of them, he had urged on the city council in his yearly reports, an addition of grit or crushed quartz to the powdered rock asphalt, to suit it to grades where the ordinary sheet asphalt would be dangerous. An English engineer named Livingstone had also, after an exhaustive visit to United States, reported favorably on the use of the asphalt block; his report appearing at length in The London Surveyor, an engineering journal highly thought of by the profession.

The asphalt block we are using is made at Hastings on the Hudson, some 30 miles from New York, by the Hastings Paving Company, 66 Broad street, New York. The block or brick, as it may be called, is made up of some 87 to 90 per cent. of crushed quartz, granite or trap rock, reduced to the consistency of coarse sand or fine gravel, in a matrix or binding mixture of Trinidad asphalt, heated to a temperature of 250° to 300° F., the two thoroughly mixed and forced into and out of steel moulds several inches in thickness to stand the stress, under a pressure of 5,000 lbs. to the square inch. This statement is exact, the writer having visited the company's premises

and witnessed the process; while he also saw the paving being laid by the company at 183rd street, New York,

There is no doubt but what the mixture of gritty matter with the asphalt or bitumen is the only thing capable of rendering the material suitable to certain grades of roadway. A portion of 183rd street, New York, falling towards the Hudson, has a grade of nearly 1 in 7 or 8, and will, I believe, prove to be too abrupt a one for such material; granite setts being better adapted to such inclines as in Mountain, Palace, Canotterie, Dambourges and Genevieve street hills, Quebec. Neither is the scoria brick suited to such slopes, as witness the upper portion of Mountain Hill, Quebec, where against the written opinion of the city engineer, they were laid, instead of continuing the stone paving to the north side of the electric railway track, at the corner of the postoffice and presbytery, where the outer rail at curve had to be laid to grade of inner rail at least, and should be even higher to guard against derailment by centrifugal action.

The paving on Grande Allee is laid on a bed of sand about half an inch thick or more, overlying a foundation of 4 inches of concrete. This is laid on the old bottom on which the tamarack blocks were laid some 12 years ago. This foundation is composed of two thicknesses of inch boards at right angles, each to the other. The boards are still in a sound state of preservation, as wood generally remains when removed from atmospheric influences, and especially when in or under water, or in wet or moist soils; while wood laid in dry sand or loam does not endure beyond a few years comparatively. I should have preferred, nevertheless, having the wood removed and replaced by so much concrete; but the extra cost would have been some 25 to 30 cents a yard or more, and reasons of economy prevailed, as it was held that the boards having already stood good for twelve years would hold out indefinitely; timber underlying old macadam having been taken up in other parts of the city, which had been there for over 50 years, and still as sound and clear of discoloration as the day it was laid.

The 4-inch concrete, as stated, was laid direct on the wooden flooring, where the height of the electric track allowed of no

intermediate material; but where the rails are laid at a higher level to rectify grade of roadway, the concrete is laid on a 2 to 3 inch bed of broken stone—that is, of the old macadam picked from between the tracks and rails and spread over the boards, after removal of the old wooden block pavement—the portion thereof occupied by the tracks having been taken up two years ago, when they were laid, and the levelling or grading made up of broken stone.

And just here it may be well to state with regard to the life of a wooden pavement of round tamarack blocks, that while that laid on the Grande Allee, twelve years ago, as stated, was found to be in a dilapidated condition from dry rot; blocks are now to be found in the sample room, city engineer's office, city hall, Quebec, which on the occasion of laying water and drainage in Couillard street, were taken up after being there for more than thirty years, and which though worn down by traffic some 2 to 3 inches, or whole height of block reduced from 8 to 6 and 5 inches, were found to be, and are to this day as perfectly sound as when laid some fifty years ago. The reason for this is that the Couillard street blocks were cut and laid green, or with the sap in them, and which under the influence of moisture from rain and the subsoil retained their sap, keeping the wood green and wet, and thus preventing dry rot; whereas, due to the grub epidemic of 1885 to 1889, the worm feeding on the needles of the tree, killed the tamarack, and this sapless wood being used on the Grande Allee instead of the live material, decay set in and dry rot ensued. The life of a wooden pavement is quoted at only seven years, except when creosoted or infiltrated with some antiseptic; while I have in my sample room, already mentioned, specimens of Australian hard woods, "Tallow" wood, "Mahogany," "Blue Gum" and Jarrah, which to test their comparative endurance under similar circumstances of traffic and exposure, were laid in one and the same street at Sydney. They were taken up after being there eleven years, and show only from 3/8 to 5/8 of an inch reduction in height during the interval, and are still absolutely sound to the very heart, though slightly discolored.

Returning now to the asphalt block, which may either be

laid on a bed of sand overlying the concrete, as stated, or preferably on a coating of half an inch of cement mortar; the blocks are laid close jointed, and are well fed to the layers, at the rate of 10 to 15 yards per man per hour (100 to 150 yards per day of 10 hours), but exclusive of closers along curb stone, which require another man or two to cut them to length and lay. The overlap of the brick as laid in New York is 4 inches (1-3 of the whole block), and thus the opposite joints occur at only every third course; but as laid here, the lap is 6 inches (half of the block), the joints thus breaking at every second or intermediate course instead of at every third; engineers differing as to which is preferable. The whole is intelligently carried on under the foremanship of a Mr. Watson of New Haven, on recommendation to F. Parent, the contractor, by the Hastings Co. The next operation is ramming down, which is done by two men with a heavy beetle (some 90 lbs.), while a third drags a half-inch plate of steel about 10 inches wide and a foot and a half long, thus always embracing more than a brick in length and two in width, and this is moved backwards and forwards along the pavement in a way always to overlap the last portion receiving the impact or the already consolidated surface.

Following this is the sanding of the joints; for though the blocks are said to touch, there are always interstices of 1-16 to ⅛ of an inch due to roughness of surface, which allows fine dry sand to percolate the joint and fill it. This sand filling was a matter of anxiety to me, as I feared that during rainy weather water might get at the foundation layer of sand and cause the blocks to settle; but no such settlement has occurred anywhere, even after a continuous and heavy two days rain. This non-percolation of surface water into the joints between the bricks I attribute to the bricks' antipathy for water, the oily and greasy nature of the bitumen being antagonistic; or may be water percolates the broader of the joints to a certain depth only, due to the repulsion referred to, and then acts as a bridge over which the rain water passes on and down the roadway.

When thoroughly sanded, or supposed to be, to all appearances, the paving is opened to traffic. Then a slight tremor of

the bricks causes the sand to settle in the joints and the sanding process is repeated to satiety; the sand requiring to be screened fine and absolutely dry (sun or fire dried), without which it will not run into the narrower interstices. It is said, though I was not long enough in New York to notice the thing, that under traffic the edge or arris of the brick gives, due to its plastic nature, and that thus the joint becomes filled in and absolutely impermeable to water.

The cost of the blocks is some $60 per 1,000, delivered at the mill or factory. Thus for transportation to Canada, some $2 per ton has to be added for freight, or $17 per 1,000, the blocks weighing about 8½ tons to the thousand. Again, there is 20 per cent. duty to pay, a toll at Rouses' Point of say $1 to $1.50 per large load, wharfage, harbour dues, etc., cartage to site of paving at say 100 blocks or 4 yards sup., per cart load (1,700 to 1,800 lbs. with us). Now add taking up and removing old pavement, grading, levelling, concreting, sand foundation and laying, and a minimum is arrived at, allowing 10 per cent. profit, of about $3.37 per yard sup. of finished paving; while the tenders for the work ranged up to $4.27 per yard.

Certain precautions are to be observed in the delivery or rather before delivery, or until the blocks have sufficiently cooled down to allow of handling, piling and rough usage in barging and unloading. The bricks to prevent sticking or adhering should be sanded between the layers, and especially on board the barge, where during the hot weather of July and August, and due to superincumbent weight, they are liable to cling together, but can be easily separated with the chisel and hammer. I have also found some of the blocks (very few) to be slightly curved, as if under pressure of overlying load, urged to hug the curved outline of the containing vessel.

The blocks, to save handling and hauling, are piled along the sidewalks on either side. It requires about three or four laborers, according to width of street, to keep the pavers or layers supplied. The brick cuts well, and square, and easily under a blow or two of the hammer, with a chisel 4 inches wide on edge, or wide enough to cover the whole breadth of block.

Between the track rails a row or course of bricks is first laid longitudinally within the rail on each side. This border course is laid to enter an inch, or as far as it will go under the upper flange or projecting head of the rail; tilting it the while to about the camber required (a quarter of an inch), when four stretchers just fill the remaining space between the opposite border courses, and the underlying sand bed is, by the use of a mold or template run along the track, resting upon the rails, cambered up in a way to cause the paving between the rails to crown at level, or a quarter or half inch over it, as may be desired; while the border courses so tilted and put in under the top of rail afford the space necessary for the car wheel flange to run in; and again, the sloped groove or depression thus left along the rail, instead of being square, which would catch and hold the wheels of vehicles, allows the wheel to move out sideways without, as in the case of the square groove, tending to haul the paving after it.

Where the fish plates and connecting wires occur (at every 30 feet or length of rail), some of the border bricks inside the rail have to be cut longitudinally, which is easily and neatly done by jumping the chisel along the brick, back and forth, as in splitting a stone parallel to its length, or along the line of proposed fracture.

When the roadway is double tracked, the space between the tracks is filled in flush with top of rail, or, as outside the tracks, a quarter of an inch higher to allow of settling by ramming and under traffic; and as laid here, it takes just three and a half bricks or stretchers to reach from rail to rail. This space is also cambered up by a sand template to half an inch additional above the concrete; as any pavement laid flat always looks hollow, and any such hollow in a roadway looks as bad as would a hollow floor or deck, instancing at the same time a want of forethought by the engineer or architect against settlement. To ensure uniformity of curve or camber in cross section of roadway from the curb to curb or curb to rail, when the paving goes on along one side of the street, while the other remains open to traffic, the best, easiest and quickest mode is to measure down from a line held taut across the roadway and resting on

curb and curb or curb and rail. It requires two hands to hold the line, but where only one is available, the string at one end can be tied to a peg or to a brick left hanging in rear of curb-stone, or in rear of rail before the track is paved or sidewalk laid. This line is successively held at distances of 3 to 4 feet along the roadway—when ordinates or vertical offsets are measured down from it to level of top of concrete—the ordinate along the rail being 4½ inches, or the thickness of the brick plus that of the sand-bed (less, if you wish, a quarter of an inch to allow for settlement by ramming and traffic); at or along the curb, the ordinate is say 9 to 10 inches, including depth of paving and height of curb there. Then half way or thereabout (the eye will do) between these extreme points another or third offset is taken, and two more, a fourth and fifth at points again half way (by eye) between the others.

To regulate height or level of pegs to be driven for top of concrete, Mr. Watson has an ingenious mode of offsetting by means of a stick with a notch in it at 4½ inches from level of string, one at 9 inches, and three others at intermediate heights as required and calculated in advance, or measured from a template cut to camber of roadway. He then sets and drives his peg home, or until the top of it is just at proper level to suit offset. These five offsets have of course to be repeated for as many pegs on the other side of the roadway, when in turn that side is being paved, and the paved side handed over to traffic.

To form the sand-bed, strips or templates ½-inch thick are laid at distances along the road of 8 to 10 feet; when two men, one at each end of a straight edge, move it and the sand with it along the templates in a direction parallel to rail and curb and back and forth until the sand is worked down to proper level. I had omitted to say that the paver or layer, instead of, as usual, standing on the unpaved portion, keeps on the portion already laid; as standing on the sand-bed when prepared as above stated would altogether jeopardize the regularity of the work.

This asphalt block pavement is certainly an improvement on the sheet asphalt as far as durability is concerned, it being

4 inches thick, while the sheet is but one to one and a quarter inch. Again, the grit in it suits it to ordinary grades where the sheet would prove slippery and dangerous. Neither will this asphalt block be suitable for heavy traffic or for quick or steep grades or inclines, where nothing but granite setts should be used. The sheet has been laid, against my advice, in such narrow and trafficy streets as St. Paul and St. Peter, Quebec, where on account of wheels travelling constantly in same line. the asphalt will soon be worn into ruts and hollows. The sheet is suitable for residential streets, and especially where there are no rails, as in some of the streets at Westmount, Montreal. where, after, they say, nine years laid, it shows no sign of failure; but in St. James, Notre Dame and other streets, where the traffic is comparatively heavy and tracks exist, the asphalt begins to give a quarter of an inch at a time along the rails under the erosive action of the wheels of vehicles, and then it goes on crumbling, a fraction of an inch at a time, until wide ruts are formed, which have to be repaired.

The Hastings Company also manufacture hexagonal blocks for sidewalks. They make them about 2¼ to 2½ inches thick, which is too heavy and expensive. I have advised the company to reduce these to 1¾ inch, or even 1½ inch, as sufficiently thick to stand foot passenger traffic for years to come. We are about laying a quantity of sidewalks in Quebec with these, which on account of the greater measure of grit in them will prove preferable to the "mastic," as laid hot and rolled or smoothed with wooden pallets. The latter becomes somewhat disagreeable to walk on during hot weather, and especially while the sun shines hot upon it, when it almost instantaneously softens to the consistency of putty or of soft or kneaded clay puddle, and the foot actually sinks into it, perceptibly, or say a sixteenth of an inch or so, though it immediately hardens again the moment the sun is obscured.